No. 200000159

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Minnesota Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE , OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'McVey'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this third day of December, in the year two thousand one.

Attest:

Paul M. Jeanbourquin

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Dan Glickman

Secretary of Agriculture

REPRODUCE LOCALLY. *Include form number and date on all reproductions.* FORM APPROVED - OMB NO. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE DIVISION - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a).

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) *(as it is to appear on the Certificate)*
Minnesota Agricultural Experiment Station

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER
MN93413

3. VARIETY NAME
McVey

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
University of Minnesota
190 Coffey Hall
1420 Eccles Avenue
St. Paul, MN 55108

5. TELEPHONE *(include area code)*
612/625/4211

6. FAX *(include area code)*
612/624/7724

FOR OFFICIAL USE ONLY

PVPO NUMBER

FILING DATE: 2/15/01

7. GENUS AND SPECIES NAME
Triticum aestivum L.

8. FAMILY NAME *(Botanical)*
Graminecia

9. CROP KIND NAME *(Common name)*
Hard Red Spring Wheat

FEES RECEIVED
FILING AND EXAMINATION FEE: $ 2450
DATE: 2/15/01
CERTIFICATION FEE: $ 320.00
DATE: 10/15/2001

10. IF THE APPLICANT NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)* *(Common name)*
Minnesota Agricultural Experiment Station

11. IF INCORPORATED, GIVE STATE OF INCORPORATION

12. DATE OF INCORPORATION

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS
James Anderson
411 Borlaug Hall
1991 Upper Buford Circle
University of Minnesota
St. Paul, MN 55108

14. TELEPHONE *(include area code)*
612/625/9763

15. FAX *(include area code)*
612/625/1268

16. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED *(Follow instructions on reverse)*

a. ☒ Exhibit A. Origin and Breeding History of the Variety
b. ☒ Exhibit B. Statement of Distinctness
c. ☒ Exhibit C. Objective Description of the Variety
d. ☒ Exhibit D. Additional Description of the Variety
e. ☒ Exhibit E. Statement of the Basis of the Applicant's Ownership
f. ☒ Voucher Sample *(2,500 viable untreated seeds or, for tuber propagated varieties verification that tissue culture will be deposited and maintained in a public repository)*
g. ☒ Filing and Examination Fee ($2,450), made payable to "Treasurer of the United States" *(Mail to PVPO)*

17. DOES THE APPLICANT SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY, AS A CLASS OF CERTIFIED SEED? *(See Section 83(a) of the Plant Variety Protection Act)*
☒ YES *(If "yes," answer items 18 and 19 below)* ☐ NO *(If "no," go to item 20)*

18. DOES THE APPLICANT SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☒ YES ☐ NO

19. IF "YES" TO ITEM 18, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?
☒ FOUNDATION ☒ REGISTERED ☒ CERTIFIED

20. HAS THE VARIETY OR A HYBRID PRODUCED FROM THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES?
☒ YES *(If "yes," give names of countries and dates)* ☐ NO

MAH 7-3-2001 2/15/2001

21. The applicant(s) declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned applicant(s) is(are) the owner(s) of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 41, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Applicant(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT *(Owner(s))*		SIGNATURE OF APPLICANT *(Owner(s))*	
NAME *(Please print or type)*		NAME *(Please print or type)*	
CAPACITY OR TITLE	DATE	CAPACITY OR TITLE	DATE

16a. Origin and Breeding History of the Variety

Pedigree: Ning 8331/MN87029//MN89068:

Where Ning 8331 is a variety from China with the Sumai 3 source of resistance to scab. MN87029 is a Minnesota breeding line with the pedigree MN81136/Vance. MN89068 is a Minnesota breeding line developed from the cross of other Minnesota breeding lines whose ancestry includes the cultivars Chris, Era, and Kitt.

The crosses involved in the three-way cross Ning 8331/MN89029//MN89068 were made under the direction of Dr. R. Busch, USDA-ARS, University of Minnesota, at St. Paul in 1989 and 1990. The F1 was grown in the greenhouse, and F2 space-planted in the field for individual plant selection. Disease testing for leaf rust and stem rust began with the F2 generation in inoculated nurseries in 1991 and continued each generation. The F3 generation was grown in the greenhouse in 1991-1992 to advance to the F4. F4 head rows were grown in the field in 1992, and selected F5 head-rows grown in AZ winter increase in 1992-93.

Yield testing was initiated in 1993 with an F4 derived F6 line with the breeding number MN93413. Field-testing for *Fusarium* head blight (FHB) began in inoculated nurseries in 1994 and in the greenhouse in 1994. Both field and greenhouse testing continued in each succeeding generation for rusts and FHB. Small plot bread-making quality testing was initiated following the 1993 growing season and continued each year through release at the USDA-ARS Spring Wheat Quality Laboratory, Fargo, ND.

MN93413 was tested in advanced state trials from 1994 through 1999. Wide area testing was conducted in the Uniform Regional Hard Red Spring Wheat Nursery in a total of 38 environments from 1996 to 1998. The Wheat Quality Council conducted large plot quality testing (1/4 acre) in 1997 and 1998 allowing about 15 milling and baking companies to evaluate the potential quality of the line prior to release compared to the high quality check variety, Grandin.

About 500 heads were selected in 1996 and grown in California in the fall and winter of 1996-97. Uniform rows were selected and harvested as a purified bulk. This seed was planted at St. Paul in 1997 to produce breeder's seed. Further seed was increased of approximately 100 acres in 1998 producing approximately 4000 bushel of Foundation seed. Further seed increase occurred in California in the fall and winter of 1998-99 on about 50 acres producing another 4000 bu. A total of 8000 bushels of seed were available as registered class in 1999.

The variety has been uniform and stable for four generations. No variants have been observed.

16b. Novelty Statement

Morphologically, McVey most closely resembles Reeder, compared to the other modern hard red spring wheat cultivars grown in the Upper Midwest. McVey differs from Reeder primarily by having weaker straw, lower test weight and protein and higher resistance to scab as well as having different gliadin pattern. Dr. K. Khan, Department of Cereal Science, North Dakota State University, Fargo, ND was requested to obtain clear and useful gliadin fraction gels for cultivar identification. The procedure used is published (K. Khan, R. Frohberg, T. Olson, and L. Huckle. 1989. Inheritance of gluten protein components of high-protein hard red spring wheat lines derived from *Triticum trugidum* var. *dicoccoides*. Cereal Chemistry 66 (5): 397-401). Dr. Khan used PAGE gel electrophoresis to determine the gliadin fraction of the gluten protein. It is the end product of the cultivar's genetic constitution that produces the cultivar's gliadin fraction. These gliadin bands are called genetic markers and are commonly used to discriminate among cultivars. Unlike many morphological traits that are phenotypic measures, gliadins are not affected by environment and represent consistently repeatable genotypic differences.

In 1998, Dr. Busch requested gliadin fractionation to provide genetic differentiation among the following varieties for Plant Variety Protection: McVey, Marshall, Norm, Verde, 2375, Grandin, Kulm, Trenton, Sharp, Russ, Oxen, Forge, Lars, Hamer, Nora, Sharpshooter, Keene, HJ98, and Mercury. In 1999, gliadin fractionation was requested for McVey and the following varieties: Ember, Gunner, Hagar, HJ98, Ingot, Ivan, Norpro, Parshall, and Reeder.

In the 1998 fractionation, McVey differs from all varieties except Verde, 2375, Oxen and Nora because of McVey's lack of band 5 that the other varieties possess (Fig.1). McVey lacks band 4 that Verde possesses. McVey has band 9 that differentiates it from Nora. Oxen lacks band 14 that McVey possesses. In the 1999 fractionation, McVey may be differentiated from Gunner, Hagar, HJ98, Ingot, Ivan, Norpro, Parshall and Reeder by McVey's absence of band 5. McVey differs from Ember by McVey's lack of band 6 which is present in Ember.

Only 2375 could not be distinguished from McVey on the basis of gliadin fractionation. However, glutenin fractionation of McVey and 2375 indicated that McVey possesses band 2 that differs from 2375 which possesses band 2* (Example Fig. 3). Further, McVey is 2 days later to head, is about 2 pounds/bushel lighter in test weight, and is one percentage point lower in grain protein (Table 1). McVey has a spike color that is similar to the Ning 8331 parent color (lighter green) than the spike color of 2375.

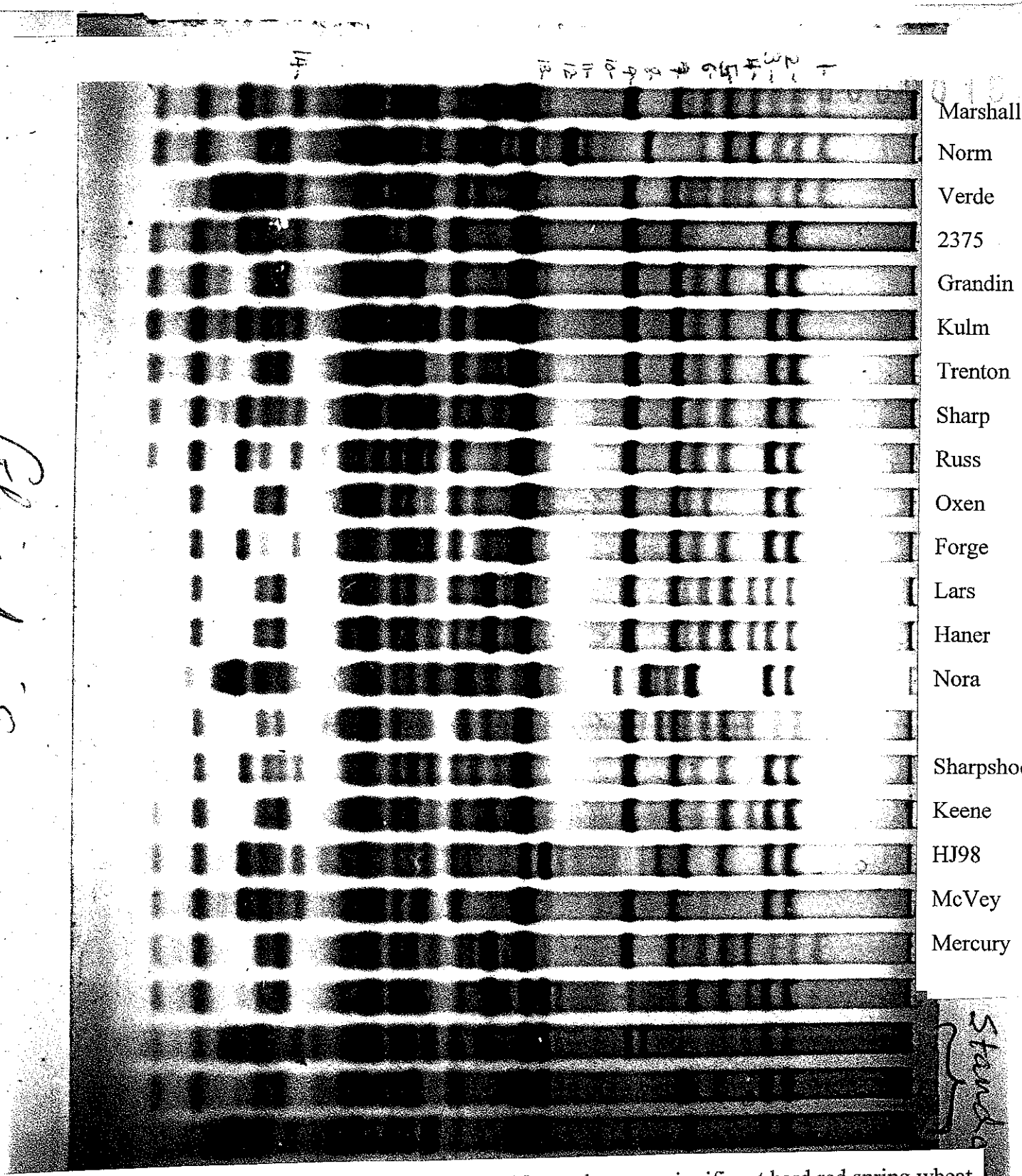

Fig. 1. Gliadin fractionation (PAGE) of McVey and new or significant hard red spring wheat varieties in 1998.

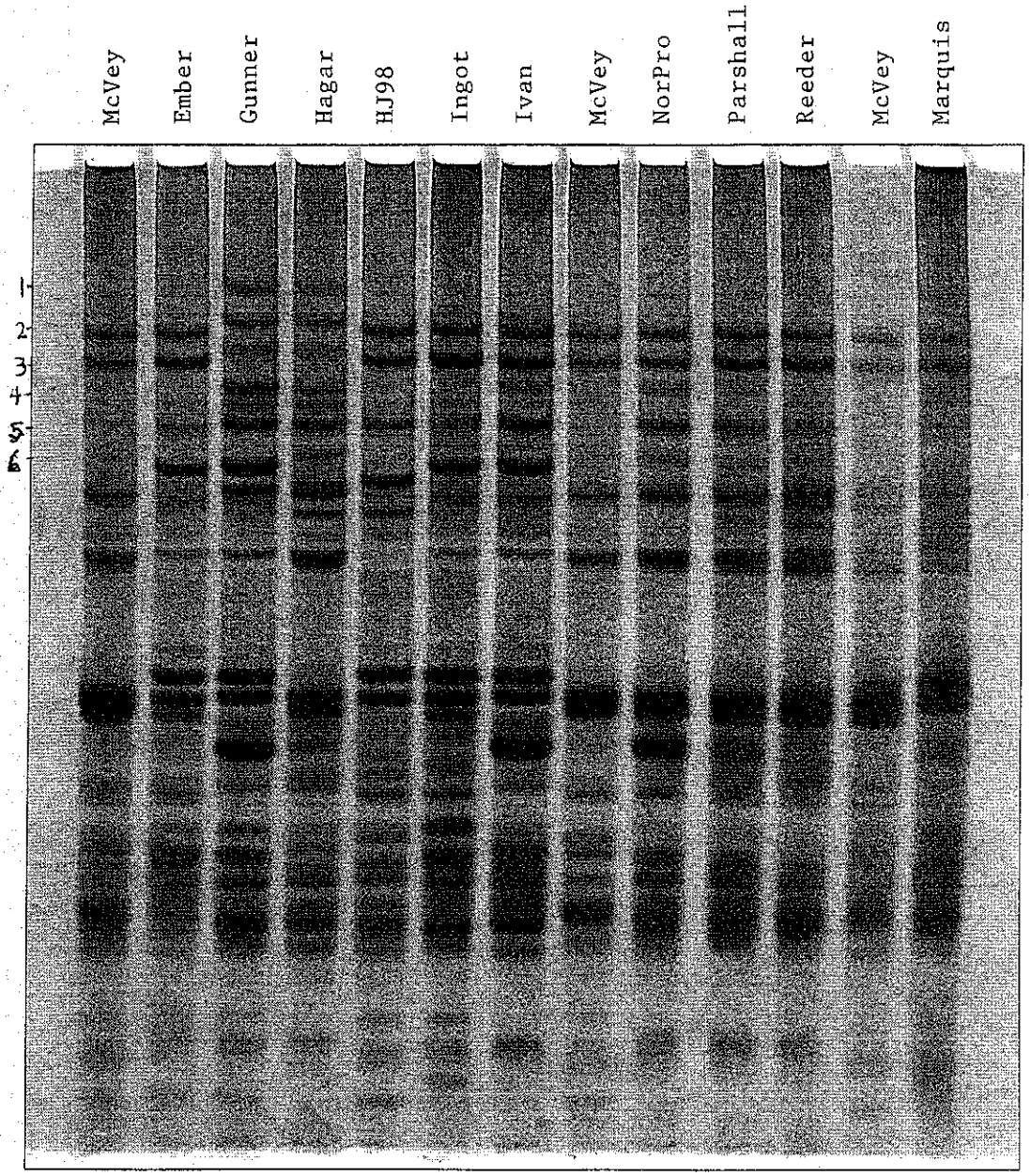

Fig. 2. Gliadin fractionation (PAGE) of McVey and new hard red spring wheat varieties in 1999.

16c. Objective Description of the Variety

McVey is a hard red spring wheat, *Triticum aestivum* L. Agronomic data collected from 19 location-years from Minnesota variety trials on McVey and selected presently or recently grown varieties in the Upper-Midwest from 1997 through 1999 are presented in Table 1. A combined analysis of variance of each environment and over all environments was conducted for traits with replicated data. An FLSD 0.05 was computed using cultivar x environment interaction from the combined analysis of variance except for the disease rating. This test assumes that the environments are random and provides a conservative test for differences among varieties. Producers were growing Verde, Russ, Oxen, HJ98, 2375, and Forge at the time of these tests and Grandin and Trenton are no longer tested.

McVey is significantly earlier to head than Reeder and is consider as a late variety (Table 1). McVey is intermediate in height, similar to Reeder, but differing from semidwarfs such as Verde and Oxen, and from tall varieties such as Parshall and Ingot. McVey is more susceptible than Reeder to lodging and is more prone to lodging than average. McVey is lower in test weight and protein than Reeder and the varietial mean (Table 1).

McVey has been highly resistant to all tested races of stem rust (caused by *Puccinia graminus* Pers; Pers) both in the field and in the greenhouse in seedling growth stage tests. McVey has been moderately resistant to moderately susceptible to naturally occurring races of leaf rust (caused by *Puccinia recondita* Rob. ex Desm.) in adult field tests in Minnesota. McVey is moderately resistant to moderately susceptible to foliar diseases. McVey rates as moderately resistant to the spread of scab in the head, and has average tolerance to maintain plump kernels under scab epidemics (Table 2).

McVey is very high yielding in Minnesota (Table 3). Its best performance is in northern Minnesota where it has consistently been one of the highest yielding cultivars and is the only currently available cultivar to combine moderate resistance to the spread of scab with very high yield performance in this region.

McVey has long, wide, white glumes with an apiculate shoulder and acuminate beak. The spike is awned, mid-dense, and tapering. The kernel is red in color and ovate in shape, with angular cheeks and a narrow mid-deep crease. The brush is long and has no collar.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(*Wheat*)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (*Triticum* spp.)

NAME OF APPLICANT(S)
Minnesota Agricultural Experiment Station

ADDRESS (*Street and No. or R.F.D. No., City, State, and Zip Code*)
University of Minnesota
190 Coffey Hall
1420 Eccles Avenue
St. Paul, MN 55108

FOR OFFICIAL USE ONLY

PVPO NUMBER 0 0 0 0 0 1 5 9

VARIETY NAME
McVey

TEMPORARY OR EXPERIMENTAL DESIGNATION
MN93413

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g. [ ][ ][ ] or [ ][ ]) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used: _____

Please answer all questions for your variety; lack of response may delay progress of your application.

1. KIND:

[1] 1=Common 2=Durum 3=Club 4=Other (SPECIFY) _____

2. VERNALIZATION:

[1] 1=Spring 2=Winter 3=Other (SPECIFY) _____

3. COLEOPTILE ANTHOCYANIN:

[1] 1=Absent 2=Present

4. JUVENILE PLANT GROWTH:

[3] 1=Prostrate 2=Semi-erect 3=Erect

PLANT COLOR (boot stage):

[2] 1 = Yellow-Green 2 = Green 3 = Blue-Green

6. FLAG LEAF (boot stage):

[2] 1 = Erect 2 = Recurved [2] 1 = Not Twisted 2 = Twisted

7. EAR EMERGENCE:

[0][2] Number of Days Earlier Than Marshall *

[0][1] Number of Days Later Than Chris *

8. ANTHER COLOR:

[1] 1 = YELLOW 2 = PURPLE

9. PLANT HEIGHT (from soil to top of head, excluding awns):

[0][8] cm Taller Than Marshall *

[1][3] cm Shorter Than Chris *

10. STEM:

A. ANTHOCYANIN
[1] 1= Absent 2=Present

B. WAXY BLOOM
[1] 1=Absent 2=Present

C. HAIRINESS (last internode of rachis)
[2] 1=Absent 2=Present

D. INTERNODE (SPECIFY NUMBER) 4
[1] 1=Hollow 2=Semi-solid 3=Solid

E. PEDUNCLE
[2] 1=Absent 2=Present

[16] cm Length

11. HEAD (at Maturity):

A. DENSITY
[2] 1=Lax 2=Middense 3= Dense

B. SHAPE
[1] 1 = Tapering 2= Strap 3 = Clavate 4 = Other (SPECIFY) _____

C. CURVATURE
[2] 1 = Erect 2 = Inclined 3 = Recurved

D. AWNEDNESS
[4] 1 = Awnless 2 = Apically Awnletted 3 = Awnletted 4 = Awned

12. GLUMES (at Maturity):

A. COLOR
[1] 1 = White 2 = Tan 3 = Other (SPECIFY) _____

B. SHOULDER
[6] 1 = Wanting 2 = Oblique 3 = Rounded 4 = Square 5 = Elevated 6 = Apiculate

C. BEAK
[3] 1 = Obtuse 2 = Acute 3 =Acuminate

D. LENGTH
[3] 1 = Short (ca. 7mm) 2 = Medium (ca. 8mm) 3 = Long (ca. 9mm)

E. WIDTH
[3] 1 = Narrow (ca. 3mm) 2 = Medium (ca. 3.5mm) 3 = Wide (ca. 4mm)

13. SEED:

A. SHAPE
[1] 1 = Ovate 2 = Oval 3 = Elliptical

B. CHEEK
[2] 1=Rounded 2=Angular

C. BRUSH
[3] 1=Short 2=Medium 3=Long

D. CREASE
[2] 1 = Width 60% or less of Kernel
2 = Width 80% or less of Kernel
3 = Width Nearly as Wide as Kernel

[1] 1 = Not Collared 2 = Collared

[2] 1 = Depth 20% or less of Kernel
2 = Depth 35% or less of Kernel
3 = Depth 50% or less of Kernel

13. SEED: (continued)

E. COLOR

[3] 1 = White 2 = Amber 3 = Red 4 = Other (SPECIFY) _____

F. TEXTURE

[1] 1=Hard 2=Soft

G. PHENOL REACTION *(see instructions)*:

[ ] 1 = Ivory 2 = Fawn 3 = Light Brown 4 = Dark Brown 5 = Black

14. DISEASE: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

Stem Rust *(Puccinia graminis* f. sp. *tritici)*
[2] TTRT TPMK RTQA RTHJ, RNVS QXCS HJCS QFBS QSHS RKQS RTQQ RTQS

Stripe Rust *(Puccinia striiformis)*
[0] _____

Tan Spot *(Pyrenophora tritici-repentis)*
[3] Field reaction

Halo Spot *(Selenophoma donacis)*
[0] _____

Septoria nodorum (Glume Blotch)
[0] _____

Septoria avenae (Speckled Leaf Disease)
[0] _____

Septoria tritici (Speckled Leaf Blotch)
[3] Field reaction

Scab (*Fusarium* spp.)
[3-2] Inoculated field nursery

"Black Point" (Kernel Smudge)
[0] _____

Barley Yellow Dwarf Virus (BYDV)
"3" [2] Field observation

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Soilborne Mosaic Virus (SBMV)
[0] _____

Wheat Yellow (Spindle Streak) Mosaic Virus
[0] _____

Wheat Streak Mosaic Virus (WSMV)
[0] _____

Other (SPECIFY) _____
[ ] _____

Other (SPECIFY) _____
[ ] _____

Other (SPECIFY) _____
[ ] _____

Leaf Rust *(Puccinia recondita* f. sp. *tritici)*
[3] Field races, Coefficient of infection 1997=0.0 1998=12%

Loose Smut *(Ustilago tritici)*
[0] _____

Flag Smut *(Urocystis agropyri)*
[0] _____

Common Bunt *(Tilletia tritici* or *T. laevis)*
[0] _____

Dwarf Bunt *(Tilletia controversa)*
[0] _____

Karnal Bunt *(Tilletia indica)*
[0] _____

Powdery Mildew *(Erysiphe graminis* f. sp. *tritici)*
[0] _____

"Snow Molds"
[0] _____

Common Root Rot *(Fusarium, Cochliobolus* and *Bipolaris* spp.)
[0] _____

Rhizoctonia Root Rot *(Rhizoctonia solani)*
[0] _____

Black Chaff *(Xanthomonas campestris* pv. *translucens)*
[3] Field reaction

Bacterial Leaf Blight *(Pseudomonas syringae* pv. *syringae)*
[0] _____

Other (SPECIFY) _____
[0] _____

Other (SPECIFY) _____
[ ] _____

Other (SPECIFY) _____
[ ] _____

Other (SPECIFY) _____
[ ] _____

15. INSECT: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE SPECIFY BIOTYPE (where needed)

Hessian Fly *(Mayetiola destructor)*	0	Other (SPECIFY)	
Stem Sawfly *(Cephus spp.)*	0	Other (SPECIFY)	
Cereal Leaf Beetle *(Oulema melanopa)*	0	Other (SPECIFY)	
Russian Aphid *(Diuraphis noxia)*	0	Other (SPECIFY)	
Greenbug *(Schizaphis graminum)*	0	Other (SPECIFY)	
Aphids	0	Other (SPECIFY)	

16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS:

Leaf Rust-Races have changed to races that have a moderately resistant to moderately susceptible reaction]

Scab=Main reason for release of McVey is high yield and resistance to spread of scab infection in the spike. McVey possesses resistance derived from Ning 8331, which was derived from Sumai #3

16d. Additional Description of the Variety

McVey was evaluated by industry in large plot trials conducted by the Wheat Quality Council in 1997 and 1998 (Table 4). McVey was 1.4 to 2.5 percentage points lower in protein than the high quality check variety, Grandin. Water absorption, mixing time, and loaf volume are all at acceptable levels, although slightly lower than Grandin. Mixing tolerance is similar to Grandin. The overall ratings of McVey were judged as acceptable to the industry for milling and baking.

Table 5 provides 1996-1997 small plot quality data comparisons of McVey with currently grown varieties. McVey is lower in protein percentage but near the mean for flour extraction, mixing pattern, and mixing time. Loaf volume, while lower than the other varieties, is considered in the acceptable range.

16e. Statement of the Basis of Applicant's Ownership

The crosses, selection, and testing involved in the development of McVey were conducted collaboratively by the Minnesota Agricultural Experiment Station spring wheat improvement program and USDA-ARS. Dr. James Anderson directs the program and Dr. Dr. Robert Busch (USDA-ARS) provided cooperative support. The Minnesota Agricultural Experiment Station, recognizing the contribution made by USDA-ARS, claims ownership of this cultivar.

Table 1. Characteristics of Hard Red Spring Wheat Varieties, 1997-1999

Variety	Heading date	Height in	Lodging score [1]	Test Weight Lb/Bu	Wheat Protein % [2]	Milling/ Baking Quality
Forge	6-19	33	2.7	59.7	14.8	med
Ingot	6-19	35	3.4	61.3	15.2	high-med
Kulm	6-20	35	3.0	60.0	15.4	high-med
Oxen	6-20	31	3.3	58.3	15.0	med
Sharp	6-20	34	3.5	60.5	14.8	med
Sharpshooter	6-20	34	3.6	60.7	14.8	med
Ember [3]	6-21	33	4.1	59.7	14.2	med
Hamer	6-21	31	2.4	59.0	14.8	med-low
2375	6-22	32	4.7	59.6	14.6	med
Parshall [4]	6-22	36	2.7	60.6	15.4	med-high
Russ	6-22	33	3.7	58.5	14.8	med
HJ98	6-23	31	4.3	57.8	14.4	med
Ivan [4]	6-23	30	2.0	58.8	13.9	med-low
Keene	6-23	37	3.5	58.9	15.2	med-high
Lars	6-23	28	2.4	57.5	14.0	med
Mercury	6-23	28	2.4	58.5	14.4	med
Nora	6-23	28	3.5	57.7	15.4	med
Norm [5]	6-23	31	2.2	57.7	14.1	med-high
NorPro	6-23	31	1.8	58.1	14.9	med
Reeder [3]	6-23	33	2.5	59.2	14.8	med-high
McVey	6-24	33	4.8	56.3	13.6	med-low
Verde	6-24	31	2.7	58.6	14.4	med-low
Gunner	6-25	34	2.9	59.6	15.9	med
Hagar	6-25	31	2.7	57.6	14.8	med
Marshall	6-26	30	1.8	56.9	14.3	med-low
Mean	6-22	32	3.3	58.8	14.9	
LSD	0.8	0.9	0.8	0.7	0.2	

1. 1 = erect, 9 = flat.
2. Corrected to 12% moisture.
3. Data from 1999.
4. Data from 1998-1999.
5. Scab susceptible check.

Table 2. Disease susceptibility and tolerances of hard red spring wheat varieties, 1997-1999

Variety	Leaf Rust [1]	Stem Rust [1]	Foliar Disease [1,2]	Scab Severity [1]	Scab Tolerance [3]
Forge	MS	MR	MS	MS-S	2.5
Ingot	MS	R	MS	MR-MS	2.0
Kulm	MR	R	MS	S-MS	2.5
Oxen	MS	MR	MS	MS-S	3.0
Sharp	MR	R	MS	MS-MR	2.5
Sharpshooter	MR	R	MS	MS-MR	2.5
Ember [4]	MR-MS	R	MS	MR	2.0
Hamer	MR	R	MR-R	MS-S	3.5
2375	MS	R	S	MS-MR	2.5
Parshall [5]	MR	R	MR-R	MS-MR	2.0
Russ	MR	MR	MS	MS	3.0
HJ98	MR	R	MS	MS	3.0
Ivan [5]	MR	R	MR	S-MS	3.5
Keene	MR	R	MR	MS-MR	3.0
Lars	MR	R	MR	S	4.5
Mercury	MR	R	MR	S	5.0
Nora	MR	R	S	S	4.0
Norm [6]	R	R	MR-R	S	5.0
NorPro	MR	--	MR	MS	3.5
Reeder [4]	MR	R	MR-R	MS	3.0
McVey	MR-MS	R	MR-MS	MR	3.0
Verde	MR	R	MR-R	MS	3.0
Gunner	MR-MS	R	MR	MR-MS	2.5
Hagar	MR	R	MS	S-MS	4.0
Marshall	MS	R	MS	MS-S	3.5

1. R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible.
2. Ratings based on NDSU data from 1996-1998 and U of MN data from 1999.
3. Tolerance to maintain plump, sound kernels under scab epidemics:
   1=very well, 2=well, 3=moderate, 4=fair, 5=poor.
4. Data from 1999.
5. Data from 1998-1999.
6. Scab susceptible check.

Table 3.Yield (percent of the mean) of hard red spring wheat varieties, 1997-1999

Variety	North				South				Average		
	Crookston [1]	Stephen	Roseau	On Farm [2]	St. Paul [1]	Morris	Waseca	Lamberton	North	South	State
Forge	102	90	96	100	88	93	104	96	96	98	97
Ingot	100	98	97	105	99	115	112	106	100	111	106
Kulm	105	97	97	--	100	106	111	117	100	112	107
Oxen	110	103	111	122	109	120	109	115	109	117	114
Sharp	105	97	96	--	86	104	100	96	100	100	100
Sharpshooter	94	94	97	94	79	89	99	78	96	89	92
Ember [4]	82	92	99	90	102	64	104	85	91	88	89
Hamer	108	102	103	--	117	113	114	113	105	117	112
2375	108	108	106	107	99	99	96	96	109	99	103
Parshall [3]	108	94	103	102	94	103	95	106	101	102	102
Russ	89	103	89	119	97	112	121	100	96	111	104
HJ98	112	116	108	101	107	104	104	105	114	107	110
Ivan [3]	122	112	117	125	127	118	111	111	117	117	117
Keene	82	92	93	89	92	92	97	105	92	99	96
Lars	111	106	104	125	124	113	108	105	108	113	111
Mercury	101	109	109	--	123	112	117	112	109	117	114
Nora	96	94	84	95	100	95	86	84	92	92	92
Norm [5]	101	96	108	--	106	101	102	114	103	108	106
NorPro [4]	103	108	97	--	113	104	109	117	103	110	107
Reeder [4]	91	90	95	109	113	118	109	116	92	114	105
McVey	102	120	113	108	100	101	106	103	115	105	109
Verde	104	105	115	107	114	100	111	118	110	112	111
Gunner	80	107	90	75	95	90	88	90	95	92	93
Hagar	95	92	110	88	101	91	87	89	101	93	96
Marshall	107	90	97	92	101	72	62	82	98	78	87
Mean (bu/ac)	42.2	47.1	48.9	48.0	40.0	54.0	43.4	45.8	45.9	45.4	45.6
LSD	22	18	18	10	21	19	15	15	11	9	8

1. Data from 1997 and 1999.
2. Data from 12 locations grown in Red River Valley in 1999, not included in North average.
3. Data from 1998 and 1999.
4. Data from 1999.
5. Scab susceptible check.

Table 4. Quality comparisons of McVey and Grandin (check) from the Wheat Quality Council Trials, 1997 and 1998

Entry	DON (a)	Protein	Mix (b) absorption	Mix (b) time	Mix © tolerance	Loaf © volumn	Overall © rating
	ppm	%	%	min.	0-6 (d)	cc	0-6 (d)
Crooksto '97 & '98							
McVey	5.5	14.4	62	4	3	1500	3.3
Grandin	10.4	15.8	63	5	3	1514	3.7
Minot '97							
McVey	0	13.5	63	3	4	1040	4.2
Grandin	0.8	15.7	64	5	5	1050	4.6
Casselton '98							
McVey	0	13.7	58	7	4	1995	3.4
Grandin	0	15.2	61	8	4	2124	4.1

(a) DON=deoxynivalenol produced by **Fusarium** spp
(b) Data from USDA-ARS Spring Wheat Quality Laboratory
(c) Means of 15 private and public quallity laboratories
(d) 0=weak to 6=strong

Table 5. Mean small plot quality comparisons of McVey with commerical cultivars grown at 3 Minnesota locations in each year, 1996 and 1997

Variety	Protein	Flour extraction	Mix (a) pattern	Mix time	Loaf volume
	%	%	1 to 11	min	cc
McVey	13.1	58.9	2.8	3.7	196
HJ98	13.8	56.4	2.8	4.2	206
Verde	13.7	63.5	2	3	202
2375	14.5	55.3	2.3	3.2	202
Oxen	14.4	62.1	3.8	3.6	210
Hamer	14.4	61.2	3.5	3.2	211
Gunner	15.7	57.7	2.5	3.1	219
Russ	14.4	57.1	3.3	3.8	206
Mean	14.3	59.4	2.9	3.4	207

(a) mixogram pttern is rated 1=very weak to 11=too strong.
intermediate number (4 to 8) is desired